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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Yu-Hung Kao

Art Unit: 2654

Serial No.: 09/590,613

Examiner: Angela Armstong

Filed: 06/08/00

Docket: TI-29099

For: METHOD OF GENERATING A COMPACT TEST-TO-PHONE PRONUNCIATION
DICTIONARY

Assistant Commissioner of
Patents
Washington, D. C. 20231

MAILING CERTIFICATE UNDER 37 C.F.R. §1.8(a)

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Robert L. Troike

Robert L. Troike, Reg. No. 24,183

4/4/03

Date

Transmitted herewith in triplicate is an Appeal Brief in the above-identified application. The Commissioner is hereby authorized to charge the **\$310.00** fee for this appeal, or credit any overpayment to Account No. 20-0668. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Robert L. Troike

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TI-29099



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE
THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of
Yu-Hung Kao

Serial No.: 09/590,613

Filed: June 8, 2000

For: Method of Generating A Compact Text-to-
Phone Pronunciation Dictionary

Art Unit: 2654

Examiner: Angela A. Armstrong

Assistant Commissioner for Patents
Washington, D. C. 20231

MAILING CERTIFICATE UNDER 37 C.F.R. §1.8(A)

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BRIEF ON APPEAL

REAL PARTY IN INTEREST

This application is assigned to Texas Instruments Incorporated, a Delaware corporation.

RELATED APPEALS AND INTERFERENCES

There are no known appeals or interferences pending or decided that relate to the subject
application.

STATUS OF CLAIMS

This is an appeal of Claims 1-13, all of the rejected claims. Please charge any costs to
Deposit Account no. 20-0668.

04/10/2003 CV0111 00000142 200668 09590613

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STATUS OF AMENDMENTS

An amendment after final was filed on January 14, 2003 and was entered canceling Claim 14 and amending Claims 1,2, 10 and 11.

SUMMARY OF INVENTION

Applicant's Claim 1 is for a pronunciation dictionary. A typical English dictionary has 70,955 entries. It takes up to 1,826,302 bytes in ASCII form. See page 1 of the specification. One must have the memory space to do the look up. It is difficult to implement a text-to-phone in an embedded system such as part of a computer chip where space is a minimum. The object is to compress the size of the pronunciation dictionary while maintaining the search ability. Each entry in the dictionary, namely, a word, there is one and only one sequence of phones to describe the pronunciation of the word. In accordance with the invention claimed in claim 1 this memory space is reduced by the dictionary containing alphabetized text and corresponding phones; having overlapping characters with previous entry that are prefix delta encoded and by a rule set to convert text to phones for text not in the dictionary and fit the rule set. The alphabetized text is the list of words is listed in alphabetical order with their corresponding phones. The dictionary further calls for the overlapping characters with previous entry to be overlapping characters with previous entry are prefix delta encoded. For example, the entry "abandoned" is following is following by "abandoning", then the nearest neighbor is encoded "-7ing". This example reduces 10 bytes to four bytes. The pronunciation dictionary further calls for a rule set to convert text to phones for text not in dictionary and fit the rule set.

Applicant's Claim 2 is a claim dependent on Claim 1 calling for the dictionary to include an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule set predictions.

Claim 3 is a dependent claim and calls for the pronunciation dictionary of Claim 2 and further describes the error encoded set to be prefix delta encoded.

Claim 4 is a dependent claim and calls for the pronunciation dictionary of Claim 3 and further for a delimiter character between each entry.

Claim 5 is an independent claim and describes a pronunciation dictionary with the combination of a rule set to convert text to phone for text not in the dictionary and an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule prediction.

Claim 6 is a dependent claim and calls for the pronunciation dictionary of Claim 5 and further for the error encoded set to be prefix delta encoded.

Claim 7 is a dependent claim calling for the pronunciation dictionary of Claim 6 and further for a delimiter character between each entry.

Claim 8 calls for the pronunciation dictionary of Claim 5 and further calls for the dictionary to include an alphabetized text and corresponding phones and for overlapping characters with previous entry to be prefix delta encoded.

Claim 9 is an independent claim calling for a processor chip for speech recognition comprising a processor, and a pronunciation dictionary that includes the combination of an alphabetized text and corresponding phones; overlapping characters with previous entry being prefix delta encoded; a rule set to convert text to phones for text not in the dictionary and an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule set prediction.

Claim 10 is an independent method claim for making a pronunciation dictionary that comprises the steps of alphabetizing text and corresponding phones; prefix delta encoding

overlapping characters with previous entry and providing a rule set for converting text to phones according to said rule set for text not in the dictionary and fit the rule set.

Claim 11 is dependent on Claim 10 and further calls for providing error encoding of the difference from the rule set for those pronunciations of text not in the alphabetized text and not fitting the rule set.

Claim 12 is a dependent claim on Claim 11 that further calls for the error encoding to be prefix delta encoded.

Claim 13 is a dependent claim on Claim 12 that further calls for the step of adding a delimiter between each entry.

ISSUES

The first issue on appeal is whether Claims 1 and 10 under 35 U.S.C. 102 (e) are anticipated by Kanevsky et al. (U.S. Patent no. 5,835,888), hereinafter Kanevsky.

A second issue on appeal is whether Claims 2-4, 9 and 11-13 under 35 U.S.C. 103 (a) are unpatentable over Kanevsky in view of Kuhn et al. (U.S. Patent no. 6,230,131), hereinafter referred to as Kuhn, and Das (U.S. patent no. 6,148,283), hereinafter Das.

A third issue on appeal is whether Claim 5 under 35 U.S.C. 103 (a) is unpatentable over Kuhn (U.S. Patent no. 6,230,131) in view of Das (U.S. patent no. 6,148,283), hereinafter Das.

A fourth issue on appeal is whether Claims 6-8 under 35 U.S.C. 103 (a) are unpatentable over Kuhn (U.S. Patent no. 6,230,131) in view of Das (U.S. patent no. 6,148,283), hereinafter Das and further in view of Kanevsky et al. (U.S. Patent no. 5,835,888), hereinafter Kanevsky.

GROUPING OF THE CLAIMS

The claims do not stand or fall together for the reasons set forth herein below under Argument.

ARGUMENT

ISSUE 1

Claims 1 and 10 are rejected in the final rejection under 35 U.S.C. 102 (e) as being anticipated by Kanevsky et al. (U.S. Patent no. 5,835,888), hereinafter Kanevsky.

Applicants claim 1 calls for:

“A pronunciation dictionary comprising:

alphabetized text and corresponding phones;

overlapping characters with previous entry that are prefix delta encoded; and

a rule set to convert text to phones for text not in the dictionary and fit the rule set.”

The examiner in the advisory action entered for purposes of appeal the amendment to Claim 1 adding “a rule set to convert text to phones for text not in the dictionary and fit the rule set”. The examiner did not provide any new argument with respect to Claims 1 and 10.

The examiner in the final rejection states that Kanevsky teaches a statistical language model for very large vocabularies, in which the language model is constructed by splitting words into stems, prefixes and endings. The examiner argues that Kanevsky discloses that the system comprises textual data in a machine-readable form which can be a large corpus of text, and a vocabulary, such as a dictionary. The vocabulary is used to create sub-vocabularies of components that comprise stems, endings and prefixes.

The background of the invention of the specification describes what a text-to-phone dictionary is as compared to building speech recognition models. In building speech recognition

models the first step is to go to the pronunciation dictionary and state with the text and look up a pronunciation dictionary of the phones for the text. Once the phones are identified and the sequence of phones for the words is determined, HMM model for each phone is determined.

The present claimed invention relates to a pronunciation dictionary. In accordance with the Claim 1 this memory space for the look up is reduced by the dictionary containing alphabetized text and corresponding phones, overlapping characters with previous entry that are prefix delta encoded; and by a rule set to convert text to phones for text not in the dictionary but fit the rule set. This combination reduces the memory space to do the lookup.

The Kanevsky reference is on language modeling for inflected language. Language modeling is statistical, namely, it describes the "probability" of a word following another word. It describes grammar in a probabilistic fashion. A pronunciation dictionary is not probabilistic at all. For each entry in a dictionary, namely, a word, there is one and only one sequence of phones to describe its pronunciation. Kanevsky split words into prefix/stem ending and then built the language model on these so-called "sub-vocabulary" instead of on the regular "word vocabulary". Applicant's claimed invention does not depend on the creation of a smaller "sub-vocabulary". Applicant's prefix does not have to have any pronunciation significance or morphological significance. It does not have to have a high frequency of appearance to be worthy of being put into the "vocabulary". As long as there is an overlap of spelling between neighboring entries, applicant's dictionary will take advantage of it. The Kanevsky reference does not discuss a pronunciation dictionary where for a word there is a single sequence of phones. The Kanevsky reference does not teach a prefix that does not have a pronunciation significance or morphological significance or have to have a high frequency of appearance to be put into the vocabulary. Kanevsky does not teach any of this and is not even concerned with the size of the

pronunciation dictionary itself. Kanevsky does not solve applicant's problem of reducing the size of the lookup table. Applicant's Claim 1 is therefore deemed allowable over the Kanevsky reference. Claim 1 further calls for the dictionary to have a text to phone rule set to predict the pronunciation. Because a rule set can predict 70% of the phones correctly, the dictionary need only encode the other 30% of the prediction error information. This prediction error information has much lower entropy, and thus requires much less space to store. This is not taught anywhere in Kanevsky. While a rule set per se is known all prior art strived to improve the rule set so that the pronunciation will be as close to a dictionary as possible. Sometimes the rule set ended up becoming larger than a dictionary, which defeats the purpose of a rule set. No prior art teaches or suggests the combination of a rule set with an alphabetized text and corresponding phones and/or overlapping characters with previous entry that are prefix delta encoded. There is nothing in the prior art to suggest this combination.

Furthermore, in regard to combining the cited prior art, reference is made to *In re Fritch*, 23 USPQ2d 1780 and particularly the portion thereof at page 1783 under "Prima Facie Obviousness" where the Court stated:

"In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. '[The Examiner] can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references.' The patent applicant may then attack the Examiner's prima facie determination as improperly made out, or the applicant may present objective evidence tending to support a conclusion of nonobviousness."

and later stated:

"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some suggestion or incentive to do so.' Although couched in terms of combining teachings found in the prior art, the same inquiry must be carried out in the context of a purported obvious 'modification' of the prior art. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification."

The combination is therefore not obvious. There is nothing in the references to suggest the combination. Claim 1 is therefore deemed allowable over the references. Claim 10 which call for the method of making a pronunciation dictionary as claimed in Claim 1 is therefore also deemed allowable over the references for at least the same reasons.

ISSUE 2

A second issue on appeal is whether Claims 2-4, 9 and 11-13 under 35 U.S.C. 103 (a) are unpatentable over Kanevsky in view of Kuhn et al. (U.S. Patent no. 6,230,131), hereinafter referred to as Kuhn, and Das (U.S. patent no. 6,148,283), hereinafter Das.

Claim 2 calls for the pronunciation dictionary of Claim 1, including an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule set predictions.

Claim 2 is therefore deemed allowable for at least the same reasons as Claim 1. None of these references teach or suggest what is claimed in Claim 1. Kuhn teaches a method of using decision tree questions to generate phone from spelling. This method requires letter only trees

and mixed trees which require a lot of memory to store. This is to deal with pronunciation that is not in the dictionary. Applicant's invention is for a different purpose. Applicants generate a dictionary accurate pronunciation using much smaller memory than that required by a standard dictionary. For the words not alphabetized listed in the dictionary with overlapping characters with previous entry that are prefix delta encoded, the other words are handled by a rule set. This is not suggested in Kanevsky or Kuhn. In addition, Claim 2 calls for the dictionary to include an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule set predictions. The examiner references the Das reference which describes a multi-stage vector quantizer, which is applied on numerical data. The Das reference does not teach or suggest error coding even on text encoding, not to mention pronunciation encoding. Clearly the Das reference does not teach or suggest error coding on pronunciation encoding. The claimed combination is clearly not taught or suggested by any of these references. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. There is nothing in the references to teach or suggest the combination. Applicant's Claim 2 is therefore deemed allowable. Claims 3 and 4 dependent on Claim 2 are deemed allowable for at least the same reasons as Claim 2. Claim 3 further calls for the encoded set to be prefix delta encoded. Nothing like this is suggested in the references. Claim 4 is dependent on Claim 3 and is therefore deemed allowable for at least the same reasons Claim 3 is allowable. Claim 4 further calls for a delimiter character between each entry. The combination is not suggested in the references.

Claim 9 includes the limitations of Claim 2 and is therefore deemed allowable for at least the same reasons as Claim 2. Claim 9 further calls for a processor chip to contain a processor and the pronunciation dictionary of Claim 2. There is no suggestion in the references of such a chip.

Claim 11 is a method of making a pronunciation dictionary like that in Claim 2 and is therefore deemed allowable for at least the same reasons Claim 2 is allowable. Claim 12 is dependent on Claim 11 and is therefore deemed allowable for at least the same reasons as Claim 11. Claim 12 further calls for the error encoding to be prefix delta encoding. Claim 12 is therefore further deemed allowable for at least the same reasons as Claim 3. Claim 13 is dependent on Claim 12 and is therefore deemed allowable for at least the same reasons as Claim 12. Claim 13 further calls for adding a delimiter between each entry and is therefore deemed further allowable for at least the same reasons as Claim 4.

ISSUE 3

A third issue on appeal is whether Claim 5 under 35 U.S.C. 103 (a) is unpatentable over Kuhn et al. (U.S. Patent no. 6,230,131) in view of Das (U.S. patent no. 6,148,283), hereinafter Das. Claim 5 calls for:

“A pronunciation dictionary comprising:

a rule set to convert text to phone for text not in the dictionary; and

an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule prediction.”

None of these references teach or suggest what is claimed in claim 5. Kuhn teaches a method of using decision tree questions to generate phone from spelling. This method requires letter only trees and mixed trees which require a lot of memory to store. This is to deal with pronunciation that is not in the dictionary. Applicant's invention is for a different purpose, we want to generate “dictionary accurate pronunciation” using a much smaller memory than that required by a conventional text-to-phone dictionary. For those words not

found in the dictionary, it is handled by a rule set. The Das reference teaches a multi-stage vector quantizer, which is applied on numerical data. The examiner uses the reference to show the idea of error encoding. However, it has not been used on text encoding, not to mention pronunciation encoding. It is therefore not seen where Das in any way teaches or suggests applicant's claimed "pronunciation dictionary" comprising "an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule prediction." Further, there is no suggestion in Das or Kuhn to combine these references.

Furthermore, in regard to combining the cited prior art, reference is made to *In re Fritch*, 23 USPQ2d 1780 and particularly the portion thereof at page 1783 under "Prima Facie Obviousness" where the Court stated:

"In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. '[The Examiner] can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references.' The patent applicant may then attack the Examiner's prima facie determination as improperly made out, or the applicant may present objective evidence tending to support a conclusion of nonobviousness."

and later stated:

"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some

suggestion or incentive to do so.' Although couched in terms of combining teachings found in the prior art, the same inquiry must be carried out in the context of a purported obvious 'modification' of the prior art. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification."

In view of the above applicant's Claim 5 is deemed allowable.

ISSUE 4

A fourth issue on appeal is whether Claims 6-8 under 35 U.S.C. 103 (a) are unpatentable over Kuhn (U.S. Patent no. 6,230,131) in view of Das (U.S. patent no. 6,148,283), hereinafter Das and further in view of Kanevsky et al. (U.S. Patent no. 5,835,888), hereinafter Kanevsky.

Claims 6-8 dependent on Claim 5 are deemed allowable for at least the same reasons as Claim 5. Kanevsky does not teach or suggest the claimed rules set or the error encoded set.

Claim 6 further calls for "the error encoded set to be prefix delta encoded." Nothing is Kanevsky teaches this. Nothing in these three references suggest the error encoded set to be prefix delta encoded.

Claim 7 is dependent on Claim 6 and is therefore deemed allowable for at least the same reasons as Claim 6. Claim 7 further calls for "a delimiter character between each entry".

Claim 8 is dependent on Claim 5 and is therefore deemed allowable for at least the same reasons as Claim 5. Claim 8 further calls for "an alphabetized text and corresponding phones; and overlapping characters with previous entry are prefix delta encoded." This is neither taught nor suggest in Kuhn or Das. It is not taught in Kanevsky for the reasons discussed in Issue 1. The combination is not taught or suggested in Kuhn, Das or Kanevsky.

Furthermore, in regard to combining the cited prior art, reference is made to In re Fritch, 23 USPQ2d 1780 and particularly the portion thereof at page 1783 under "Prima Facie Obviousness" where the Court stated:

"In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. '[The Examiner] can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references.' The patent applicant may then attack the Examiner's prima facie determination as improperly made out, or the applicant may present objective evidence tending to support a conclusion of nonobviousness."

and later stated:

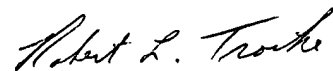
"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some suggestion or incentive to do so.' Although couched in terms of combining teachings found in the prior art, the same inquiry must be carried out in the context of a purported obvious 'modification' of the prior art. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification."

In view of the above Claim 8 is deemed allowable over these references.

CONCLUSION

For the reasons set forth above, it is clear that the Claims 1 through 13 on appeal define patentably over the cited references. Accordingly, reversal of the final rejection and allowance of the Claims 1-13 on appeal is urged that justice be done on the premises.

Respectfully submitted,



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APPENDIX

1. (amended) A pronunciation dictionary comprising:
 - alphabetized text and corresponding phones;
 - overlapping characters with previous entry that are prefix delta encoded; and
 - a rule set to convert text to phones for text not in the dictionary and fit the rule set.
2. (amended) The pronunciation dictionary of Claim 1, including an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule set predictions.
3. The pronunciation dictionary of Claim 2, wherein said error encoded set to be prefix delta encoded.
4. The pronunciation dictionary of Claim 3, including a delimiter character between each entry.
5. A pronunciation dictionary comprising:
 - a rule set to convert text to phone for text not in the dictionary; and
 - an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule prediction.
6. The dictionary of claim 5, wherein said error encoded set is prefix delta encoded.
7. The dictionary of claim 6, including a delimiter character between each entry.
8. The dictionary of claim 5, including
 - an alphabetized text and corresponding phones; and
 - overlapping characters with previous entry are prefix delta encoded.
9. A processor chip for speech recognition comprising:
 - a processor, and
 - a pronunciation dictionary comprising:

alphabetized text and corresponding phones;

overlapping characters with previous entry are prefix delta encoded;

a rule set to convert text to phones for text not in the dictionary; and an error encoded set for those entries different from the rule set wherein the entry only contains the difference with the rule set prediction.

10. (amended) A method of making a pronunciation dictionary that comprising the steps of:

alphabetizing text and corresponding phones;

prefix delta encoding overlapping characters with previous entry; and

providing a rule set for converting text to phones according to said rule set for text not in the dictionary and fit the rule set.

11. (amended) The method of Claim 10 including the step of: providing error encoding of the difference from the rule set for those pronunciations of text not in the alphabetized text and not fitting the rule set.

12. The method of claim 11, wherein the error encoding is prefix delta encoded.

13. The method of claim 12, including the step of adding a delimiter between each entry.